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1. COMPONENT/PART NAME PER GENERIC CODE Propulsion Parts & Materials, Solid Fuel Engines, Propellants		2. PROGRAM OR WEAPON SYSTEM Multiple		3. DATE OF: DAY MO YR ISSUE 13 10 67 REVISION	
4. ORIGINATOR'S SPECIFICATION TITLE Purchase Description - Cellulose Acetate, Plasticized (For Inhibitors)		5. ORIGINATOR'S SPEC. NO. WS 7659		6. SPECIFICATION IS: <input type="checkbox"/> DRAFT <input type="checkbox"/> PRELIMINARY <input checked="" type="checkbox"/> FINAL	
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Code Ident
30003

WS 7659

NAVAL AIR SYSTEMS COMMAND

DEPARTMENT OF THE NAVY

PURCHASE DESCRIPTION

CELLULOSE ACETATE, PLASTICIZED
(FOR INHIBITORS)

1. SCOPE. *260*

1.1 Scope. *This* purchase description covers two grades of plasticized cellulose acetate.

1.2 Classification. Plasticized cellulose acetate shall be of the following grades: *↑*

Grade A - As defined in Table I.

Grade B - As defined in Table I.

2. APPLICABLE DOCUMENTS.

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal forms a part of this document to the extent specified herein.

FSC 6810

WS 7659

STANDARDS

Military

MIL-STD-129

Marking for Shipment and Storage.

PUBLICATIONS

WS 7651

Cellulose Acetate.

WS 7654

Acetyl Triethyl Citrate.

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following document forms a part of this document to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM)

1965 Book of ASTM
Standards; Part 20

Test-Method ASTM D1343-54,
"Viscosity of Cellulose
Derivatives by Ball-Drop
Method."

(ASTM Publications are published by the American Society for Testing and Materials, Philadelphia 3, Pennsylvania.)

3. REQUIREMENTS.

3.1 Preproduction sample. Unless otherwise specified (see 6.2), a preproduction sample shall meet all requirements of this document. The preproduction sample shall be prepared using the same methods and procedures proposed for production. Any production prior to acceptance of the preproduction sample shall be at the risk of the supplier.

3.2 Data. No data is required by this document or by referenced documents in section 2 unless specified in the contract or purchase order.

3.3 Compliance to documents. Cellulose acetate, plasticized shall conform to the requirements herein and to the applicable requirements of documents listed in section 2.

3.4 Product characteristics and performance. When tested in accordance with 4.7 of this document, cellulose acetate, plasticized shall meet the following product characteristics and performance.

3.4.1 Chemical and physical analysis. The chemical and physical analysis of the material shall be specified in Table I.

Table I. Chemical and Physical Analysis

Characteristics	Grade A	Grade B
Cellulose Acetate, Grade B (WS 7651)	50 \pm 2%	55 \pm 2%
Acetyl Triethyl Citrate (WS 7654)	50 \pm 2%	45 \pm 2%
Viscosity, seconds	9 to 38	9 to 38

Note: Percentages are by weight

3.5 Workmanship. The cellulose acetate, plasticized shall be uniform in quality, free from foreign materials, and shall be manufactured under conditions and procedures standard in the industry.

4. QUALITY ASSURANCE PROVISIONS.

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government.

The Government reserves the right to perform any of the inspections set forth in this document where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Lot. A lot shall consist of material produced at one plant with no change in formulation or process. If manufacture is by batch process, each batch shall constitute a lot. A batch shall be as defined in 6.3.

4.3 Acceptance sampling. The number of containers to be chosen at random for acceptance sampling shall be equal to the square root of the total number of containers in the lot. If the number thus obtained is not a whole number, the number of containers to be sampled shall be increased to the next higher whole number. In no case, however, shall the number of containers to be sampled be less than seven (unless there are less than seven containers in the lot, in which case, each container shall be sampled).

4.3.1 Primary sample. From each selected container, a sample shall be taken from three or more places throughout the container. The total weight of the samples taken from each container shall weigh at least 50 grams (gm). Each sample thus taken shall be mixed thoroughly, placed in a clean dry container, and labeled to identify the material name, original container designation, contract number, and lot number.

4.3.2 Composite sample. Each primary sample shall be subdivided to prepare a composite sample (not in excess of 350 gm). Primary material not used shall be returned to the primary sample container. After mixing the composite sample thoroughly, the composite sample shall be placed in a clean, dry container and sealed. The composite sample shall be identified with the material name, container designation, contract number, and lot number. All specified chemical tests shall be made on this composite sample representing the lot. Failure of the composite sample to pass all of the tests herein shall result in rejection of the lot represented.

4.4 Classification of tests. Inspection and testing of cellulose acetate shall be classified as follows:

- (a) Preproduction tests.
- (b) Quality conformance tests.

4.5 Preproduction tests. Preproduction tests shall be conducted only on the preproduction sample and shall consist of all examinations specified in 4.6.

4.6 Quality conformance tests. Quality conformance tests for acceptance of the two grades of plasticized cellulose acetate shall consist of the following tests:

<u>Characteristics</u>	<u>Test</u>
Acetyl triethyl citrate	4.7.1
Viscosity	4.7.2

4.7 Tests. The following procedures shall be used to determine that the requirements of this document have been met. Any proposed change in test procedures of equipment shall necessitate, before adoption, prior approval of the procuring activity. In case of dispute between the results from any proposed method or equipment and what is cited herein, the results using the methods and the equipment specified in this document shall prevail. Unless otherwise specified, all tests shall run in duplicate. The average of the two results shall be taken as the test result.

4.7.1 Acetyl triethyl citrate.

4.7.1.1 Apparatus and reagents.

1. Ether, National Formulary solvent grade
2. Acetone, reagent grade
3. Erlenmeyer flask, 125 milliliter (ml)
4. Beaker, 400 ml

5. Filter flask, 500 ml
6. Fritted glass filter, medium porosity, 50 millimeters (mm) diameter
7. Analytical balance
8. Magnetic stirrer

4.7.1.2 Procedure.

- (a) Cut up the material to be used as the sample in small pieces, 1/2 inch square or less.
- (b) Place 1 to 1.5 gm sample (weighed to the nearest 0.0001 gm) in a 125 ml Erlenmeyer flask and add 50 ml of acetone. Stopper the flask with a cork stopper and allow the sample to dissolve. Do not allow acetone solution to come in contact with the cork stopper. (Solution may take overnight. If rapid solution is necessary, use a magnetic stirrer.)
- (c) Place the acetone solution in a 400 ml beaker.
- (d) Wash the 125 ml Erlenmeyer flask with 10 ml of acetone. Add this to the acetone solution while stirring.
- (e) Place the acetone solution on a hot plate and heat until it starts to boil. Add 200 ml of ether slowly into the warm acetone solution with vigorous stirring using the magnetic stirrer. Add only 100 ml of ether to initiate precipitation, and stir 5 minutes before adding the remaining 100 ml of ether.
- (f) Filter the ether solution through a fritted glass funnel (weighed to the nearest 0.0001 gm) by placing the funnel over a 500 ml filter flask and apply a vacuum to the flask using a water aspirator.
- (g) While filtering, keep the funnel and ether solution covered with watch glasses. Do not let funnel become dry at any time during filtration. Use a glass stirring rod for solution transfer.

- (h) When all the ether solution has been added to the funnel, wash the beaker with 10 ml of acetone to redissolve any cellulose acetate left in the beaker and pour into the 125 ml Erlenmeyer flask used for the sample.
- (i) Add 50 ml of ether to the beaker and pour the acetone solution in the 125 ml Erlenmeyer flask into the ether in the beaker. Keep the beaker covered.
- (j) Use the ether-acetone solution in the beaker to wash the cellulose acetate cake in the funnel. Do not add until the liquid level in the funnel is almost to the top of the cellulose acetate cake, but do not allow the funnel to become dry.
- (k) Wash the beaker with 50 ml of ether and when the liquid level in the funnel drops almost to the top of the cellulose acetate cake, add the ether to the funnel.
- (l) Aspirate the funnel until it becomes dry and continue suction for five minutes to remove most of the ether from the cellulose acetate cake.
- (m) When the odor of ether cannot be detected in the funnel, place the funnel in a 100 to 120 degree centigrade ($^{\circ}\text{C}$) (212 to 248 degree Fahrenheit ($^{\circ}\text{F}$)) oven for one hour periods until the weight of the funnel is constant.
- (n) Cool the funnel in a desiccator and re-weigh.
- (o) Calculation.

$$\text{Percent Acetyl Triethyl Citrate} = \frac{A - (B - C)100}{A}$$

Where: A = Weight of sample, gm

B = Weight of funnel and cellulose acetate cake, gm

C = Weight of funnel, gm

4.7.1.3 Acceptance criteria. For the lot represented to pass the percent acetyl triethyl citrate test, the value obtained for the percent acetyl triethyl citrate shall be within the range specified in 3.4.1.

4.7.2 Viscosity.

4.7.2.1 Apparatus and reagents.

1. Acetone - reagent grade.
2. Formula 2B ethyl alcohol (95% by volume).
3. Ordinary laboratory equipment.

4.7.2.2 Preparation of sample.

4.7.2.2.1 Solution of plasticized cellulose acetate.

- (1) Grade A. Weigh out approximately 130 gm of Grade A plasticized cellulose acetate in a tared glass dish and dry for 3 hours at 105°C (221°F). Remove sample from oven and cool in a desiccator. Add to a clean dry 16 ounce wide mouth bottle the following: 25 gm of ethyl alcohol and 191.5 gm of acetone (weigh to the nearest 0.1 gm). Rapidly transfer to the bottle 125 gm of the dried plasticized cellulose acetate (weighed to the nearest 0.1 gm) and stopper immediately. Let the bottle set until solution is complete. (Solution may take overnight or longer.)
- (2) Grade B. Weigh out approximately 130 gm of Grade B plasticized cellulose acetate in a tared glass dish and dry for 3 hours at 105°C (221°F). Remove sample from oven and cool in a desiccator. Add to a clean dry 16 ounce wide mouth bottle the following: 27.5 gm of ethyl alcohol and 191.2 gm of acetone (weighed to the nearest 0.1 gm). Rapidly transfer to the bottle 125 gm of the dried plasticized cellulose acetate (weighed to the nearest 0.1 gm) and stopper immediately. Let the bottle set until the solution is complete. (Solution may take overnight or longer.)

4.7.2.3 Procedure. Determine the viscosity in seconds by the tests in accordance with the procedure given in Test Method D1343-56 "Viscosity of Cellulose Derivatives by Ball-Drop Method" (Part 20 of ASTM, page 590). A 5/16 inch stainless steel ball and a viscosity tube with timing marks 10 inches apart shall be used in the determination. The time shall be reported in seconds for the ball to fall through a 10 inch column of solution.

4.7.2.4 Acceptance criteria. For the lot represented to pass the viscosity test, the value obtained for the viscosity in seconds shall be within the range specified in 3.4.1.

4.8 Packing and marking. Determine that all packing and marking conforms to section 5 of this document.

5. PREPARATION FOR DELIVERY.

5.1 Preservation and packaging. Not applicable (unless specified in the contract or purchase order).

5.2 Packing.

5.2.1 Level A. Not applicable.

5.2.2 Level B. Not applicable.

5.2.3 Level C. The material shall be packed as directed in the contract to afford protection against damage during direct shipment from the supply source to the first receiving activity for immediate use. Containers shall comply with common carrier regulations applicable to the mode of transportation to be used. (See 6.2.)

5.3 Marking.

5.3.1 Special markings. Not applicable.

5.3.2 Normal markings. In addition to the markings required by contract or purchase order, unit packages and shipping containers shall be marked in accordance with the requirements of MIL-STD-129.

6. NOTES.

6.1 Intended use. Grade A and B plasticized cellulose acetate covered by this document is intended for use as an inhibitor material for ammonium-nitrate-based solid propellants.

6.2 Ordering data. Procurement documents should specify the following information:

- (a) Title, number, and date of this document.
- (b) Whether a preproduction sample is required (see 3.1).
- (c) Grade of plasticized cellulose acetate.
- (d) Type and size of shipping container.

6.3 Definition.

6.3.1 Batch. A batch is defined as that quantity of material which has been subjected to one or more chemical or physical processes (or combinations thereof) intended to produce a desired product having substantially uniform characteristics. The final step in the processing must have treated the entire contents of the batch at one time.

6.4 Safety and health warning. Handling of the chemicals specified herein shall be in accordance with suitable safety and health precautions.

6.5 Approved products. The approved products under this document are as follows:

- Grade A - Tenite Acetate A-1915-43E-A, manufactured by Eastman Chemical Products, Inc., Kingsport, Tennessee.
- Grade B - Tenite Acetate A-1915-43D-E, manufactured by Eastman Chemical Products, Inc., Kingsport, Tennessee.

Custodian:
NASC 52021E

Preparing Activity:
NWC/China Lake, California